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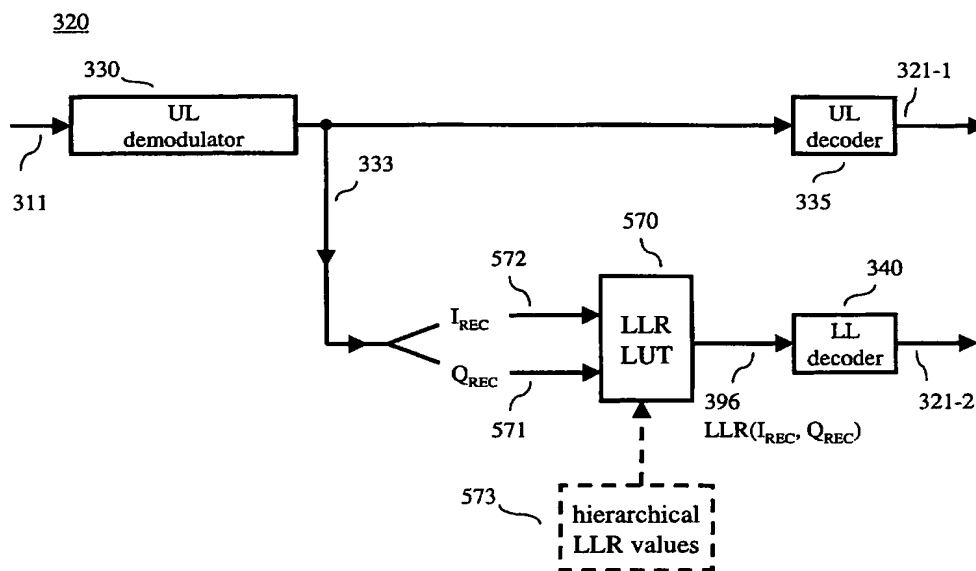
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[Continued on next page]

(54) Title: APPARATUS AND METHOD FOR DECODING IN A HIERARCHICAL MODULATION SYSTEM



(57) Abstract: A satellite receiver receives a hierarchical modulation based signal, which has at least an upper layer (UL) and a lower layer (LL), and simultaneously or independently recovers therefrom data conveyed in the UL signal and data conveyed in the LL signal.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

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# INTERNATIONAL SEARCH REPORT

International Application No  
**PCT/US2004/013735**

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04L27/34 H04L27/38 H04L1/00 H04L25/06

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	TARICCO G ET AL: "Some simple coded-modulation schemes for unequal error protection in satellite communications" SPREAD SPECTRUM TECHNIQUES AND APPLICATIONS PROCEEDINGS, 1996., IEEE 4TH INTERNATIONAL SYMPOSIUM ON MAINZ, GERMANY 22-25 SEPT. 1996, NEW YORK, NY, USA, IEEE, US, 22 September 1996 (1996-09-22), pages 1288-1294, XP010208825 ISBN: 0-7803-3567-8	1-3, 5, 14, 15, 18, 19
Y	Sections II and III  figure 1  -----  -/--	4, 6, 16, 17

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
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Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2004/013735

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DIVSALAR D ET AL: "Multiple turbo codes" MILITARY COMMUNICATIONS CONFERENCE, 1995. MILCOM '95, CONFERENCE RECORD, IEEE SAN DIEGO, CA, USA 5-8 NOV. 1995, NEW YORK, NY, USA, IEEE, US, 5 November 1995 (1995-11-05), pages 279-285, XP010153973 ISBN: 0-7803-2489-7 page 283, left-hand column, paragraph 1 Section IX	4,17
Y	US 5 657 354 A (THESLING III WILLIAM H ET AL) 12 August 1997 (1997-08-12) column 3, line 58 - line 67	6,12,13, 16
A	CALDERBANK A R: "Multilevel codes and multistage decoding" IEEE TRANSACTIONS ON COMMUNICATIONS, vol. 37, no. 3, March 1989 (1989-03), pages 222-229, XP002304039 Section III-A	1-6, 14-19
A	KANNAN RAMCHANDRAN: "MULTIRESOLUTION BROADCAST FOR DIGITAL HDTV USING JOINT SOURCE/ CHANNEL CODING" IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS, IEEE INC. NEW YORK, US, vol. 11, no. 1, 1993, pages 6-22, XP000377993 ISSN: 0733-8716 figure 6b	1-6, 14-19
X	LIM J-H ET AL: "Labeling and decoding schemes for backward-compatible hierarchical coded modulation" 2000 IEEE WIRELESS COMMUNICATIONS AND NETWORKING CONFERENCE. CONFERENCE RECORD, vol. 1, 23 September 2000 (2000-09-23), pages 123-128, XP010532479	10,11
Y	page 123, right-hand column, paragraph 2 figure 3a	12,13
X	SCHILPP M ET AL: "Multilevel codes for digital HDTV" COMMUNICATION TECHNOLOGY PROCEEDINGS, 1996. ICCT'96., 1996 INTERNATIONAL CONFERENCE ON BEIJING, CHINA 5-7 MAY 1996, NEW YORK, NY, USA, IEEE, US, 5 May 1996 (1996-05-05), pages 771-776, XP010532925 ISBN: 0-7803-2916-3 figure 1b page 773, left-hand column, last paragraph sections II-A, II-B	10,11
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# INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2004/013735

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>SCHRAMM P: "Multilevel coding with independent decoding on levels for efficient communication on static and interleaved fading channels" PERSONAL, INDOOR AND MOBILE RADIO COMMUNICATIONS, 1997. WAVES OF THE YEAR 2000. PIMRC '97., THE 8TH. IEEE INTERNATIONAL SYMPOSIUM ON HELSINKI, FINLAND 1-4 SEPT. 1997, NEW YORK, NY, USA, IEEE, US, 1 September 1997 (1997-09-01), pages 1196-1200, XP010247636 ISBN: 0-7803-3871-5 figure 4</p>	10-13
A	<p>PAPKE L ET AL: "Different iterative decoding algorithms for combined concatenated coding and multiresolution modulation" COMMUNICATIONS, 1994. ICC '94, SUPERCOMM/ICC '94, CONFERENCE RECORD, 'SERVING HUMANITY THROUGH COMMUNICATIONS.' IEEE INTERNATIONAL CONFERENCE ON NEW ORLEANS, LA, USA 1-5 MAY 1994, NEW YORK, NY, USA, IEEE, 1 May 1994 (1994-05-01), pages 1249-1254, XP010126691 ISBN: 0-7803-1825-0 section 3.1</p>	10-13
A	<p>US 5 983 174 A (WONG ET AL) 9 November 1999 (1999-11-09) column 1, line 20 - line 36 column 10, line 28 - column 11, line 25</p>	7-9

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2004/013735

## - Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box III Observations where unity of invention is lacking (Continuation of Item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☒ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-6, 14-19

These claims are directed to a receiver/receiving method for a hierarchical signal, in which both signal layers are recovered at the same time (simultaneously).  
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2. claims: 7-9

These claims are directed to a receiving method for a hierarchical signal, wherein soft-metric values used in the recovering operation are determined as a function of a training signal.  
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3. claims: 10-13

These claims are directed to a receiver for a hierarchical signal, in which both signal layers are recovered independently of each other.  
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2004/013735

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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